UCRL-JC-124484 Abs Rev 1

Yield and Emission Line Ratios from ICF Target Implosions with multi-mode Raleigh-Taylor Perturbations*

Steven H. Langer
Chris Keane
Howard A. Scott
Lawrence Livermore National Laboratory

In this paper we report results of detailed spectral postprocessing calculations of indirectly driven ICF implosions. These simulations model NOVA capsules where argon has been placed as a dopant in the DT fuel and titanium has been placed in the inner layers of the plastic shell. The argon emission line ratios are used to diagnose fuel temperature and the titanium line emission is used to diagnose the mixing of fuel and pusher material. We use Lasnex to simulate the implosion of a two-dimensional capsule with surface perturbations covering a range of wavelengths. The perturbations grow during the Raleigh-Taylor unstable phases of the implosion. The Lasnex simulations are postprocessed using detailed atomic kinetics models to produce simulated spectra of argon and titanium. The models are run for several values of capsule surface roughness. We compare the thermonuclear yield and line emission as a function of surface roughness. Our results are compared to the predictions of Haan's mix model, which computes a mix depth based on Lasnex runs with single wavelength Raleigh-Taylor perturbations.

*Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.